HCI: THE DESIGN PROCESS

Dr Kami Vaniea
First, the news...

- Make Your UX Design Process Agile Using Google’s Methodology
- https://www.interaction-design.org/literature/article/make-your-ux-design-process-agile-using-google-s-methodology
Accessibility
Basic steps to accessibility

- Add appropriate alt text to every image
- Use headings correctly
- Make your forms work with screen readers
- Use a “Skip to Main Content” link at the beginning of each page
- Make all content accessible by keyboard
- Create significant contrast between your text and background
- Use an accessible template
Add appropriate alt text to images
Accessibility links

<ul>
<li><a href="#hp-bbc-homepage-content">Skip to content</a></li>
<li><a id="orb-accessibility-help" href="/accessibility/" aria-label="#orb-accessibility-help"">Accessibility Help</a></li>
</ul>
What level of technical skill can we expect out of “average” users?
Distribution of Computer Skills Among People Aged 16–65

- Level 3 (strong)
- Level 2 (medium)
- Level 1 (poor)
- Below 1 (terrible)
- Can’t use computers

https://www.nngroup.com/articles/computer-skill-levels/
Design Process
**Design process**

1. **What is wanted**
   - Interviews
   - Ethnography

2. **Analysis**
   - Scenarios
   - Task analysis

3. **What is there vs. what is wanted**

4. **Guidelines**
   - Principles

5. **Design**
   - Precise specification

6. **Prototype**
   - Dialog notations

7. **Implement and deploy**
   - Architectures
   - Documentation
   - Help

---

**Evaluation**
- Heuristics
The following is part of a MSc project from last summer on re-designing permission screens for Android.
Describing how an app uses permissions

Allowed to do

Actually does

States:
- $q_0$: MAIN
- $q_1$: SEND_SMS
- $q_2$: SEND_SMS
- $q_3$: SMS_RECEIVED
- $q_4$: READ_PHONE_STATE

Events:
- click

Permissions:
- Device & app history
  - retrieve running apps
- Identity
  - find accounts on the device
  - add or remove accounts
  - read your own contact card
- Calendar
  - add or modify calendar events and send email to guests without owners' knowledge
  - read calendar events plus confidential information
- Contacts
  - modify your contacts
  - read your contacts
- Location
  - approximate location (network-based)
  - precise location (GPS and network-based)

Updates to Facebook may automatically add additional capabilities within each group. Learn more.
Static analysis: Breaks an app up into a control flow diagram

The Flashlight

Advertising

```
openConnection
  Opens a connection to the internet
requestLocationUpdates
  Get access to your location probably to send it on using the later openConnection call
```

requestLocationUpdates
The brief:

Create a new permission screen using the output from a static analysis tool that helps people understand the context in which permissions will be used.
Problem 1:

What permissions do people worry about?

Sub-problem:

Most people don’t understand permissions enough to actually worry about them
Solution:

Affinity diagram using Computer Security MSc students
Design process

What is wanted

- Interviews
- Ethnography

What is there vs. what is wanted

Analysis

- Scenarios
- Task analysis

Design

- Guidelines
- Principles

Precise specification

Prototype

- Evaluation
- Heuristics

Implement and deploy

- Architectures
- Documentation
- Help

Dialog notations
Protocol

1. Pre-print a list of Android permissions and contexts
2. Have students brainstorm answers to questions onto sticky notes
   A. Name three permissions
   B. App behaviors you are not comfortable with
   C. Situations that would cause a permission to be used
3. Put all notes on the wall and do an affinity diagram
4. Encourage hierarchy design
5. Discuss outcome with participants as a group
Pre-printed contexts
Pre-printed contexts

PERMISSION

ACCESS_CHECKIN_PROPERTIES

Allows read/write access to the "properties" table in the checkin database, to change values that get uploaded.

PERMISSION

ACCESS_COARSE_LOCATION

Allows an app to access approximate location.

CONTEXT

DESTROY_METHOD

Called when an activity* finishes its life cycle. Called once in the lifecycle of an activity*.

*activity: application window

CONTEXT

SERVICE_METHOD

A Service is an application component that can perform long-running operations in the background and does not provide a user interface.
Examples of pre-printed and brainstormed sticky notes

- Allow to use microphone
- Apps like Skype would need to use your microphone
- Recording audio in background
- Recording with microphone
- Need to record voice
- Voice
- Microphone turned on without a button push
- Doing something in background without explicit intent
- Click button
Initial sorting

• This stage looked a lot like your tutorial
• We just sorted all the notes on the wall and added a few notes where needed
Then we added structure
CAMERA.

Push the camera button
TAKING A PICTURE
ALLOW TO USE CAMERAS microscopy cameras use without specifically having requested it
USING CAMERA
Camera

OPEN CAMERA
CAMERA USE CAMERA
Take a picture
APPS LIKE SNAP CHAT WOULD NEED TO USE YOUR CAMERA

Taking a photo.

LOCATION/ MAP

ACCESS_LOCATION_EXTRA_COMMANDS
INSTALL_LOCATION_SERVICE
ACCESS_COARSE_LOCATION
LOCATION_HARDWARE
CONTROL_LOCATION_UPDATES

Permissions

UNINSTALL_SHORTCUT
INSTALL_SHORTCUT
BROADCAST_PACKAGE_REMOVED
REQUEST_INSTALL_PACKAGES
DELETE_PACKAGES
How do we qualitatively analyze an affinity diagram?
Design process

1. What is wanted
   - Interviews
   - Ethnography
2. What is there vs. what is wanted
3. Analysis
   - Scenarios
   - Task analysis
4. Design
   - Guidelines
   - Principles
   - Precise specification
5. Prototype
   - Dialog notations
6. Implement and deploy
   - Architectures
   - Documentation
   - Help
In the Background

- Location
- Accounts and device info
- Camera
- SMS
- Contacts
- Calendar
- Microphone
- Internet combined with read data
- Settings
- Ads
- Notifications
- Screen space
- Sounds
Outcomes

- “with my permission”
  - Button presses
  - Opening an app
- Background vs. foreground
  - When the permission is accessed is important
- Purpose
  - Ads
  - Uploading private data like contacts and device ID
- Sensitive permissions focused on input/output
- Confusing permissions
**Design process**

- **What is wanted**
  - Interviews
  - Ethnography

- **What is there vs. what is wanted**

- **Analysis**
  - Scenarios
  - Task analysis

- **Prototype**
  - Dialog notations

- **Design**
  - Guidelines
  - Principles

- **Implement and deploy**
  - Precise specification
  - Architectures
  - Documentation
  - Help
We designed an interface that shows permissions in context of when they can be used.

- **Button push required**
  - Contacts
    - modify your contacts
    - read your contacts

- **Only when app is open**
  - Calendar
    - add or modify calendar events and send email to guests without owners’ knowledge
    - read calendar events plus confidential information

- **Anytime in the background**
  - Identity (Ad software)
    - find accounts on the device
    - add or remove accounts
    - read your own contact card
  - Location
    - approximate location (network-based)
What is wanted

- Interviews
- Ethnography

What is there vs. what is wanted

Scenarios
Task analysis

Analysis

Guidelines
Principles

Precise specification

Prototype

Dialog notations

Design

Implement and deploy

Architectures
Documentation
Help
Created two interfaces to A/B test

(a) Control group screen  (b) Experiment group screen

Figure 5.1: Survey question screens
Which of the following can this app do?

<table>
<thead>
<tr>
<th>Option</th>
<th>Absolutely Possible</th>
<th>Impossible</th>
<th>Neutral</th>
<th>Possible</th>
<th>Absolutely Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge purchases to your credit card at any time.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Get your location.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Allow ads to know your location.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Load ads.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Write on the SD card</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
What is wanted

- Interviews
- Ethnography

What is there vs. what is wanted

Analysis

- Scenarios
- Task analysis

Guidelines
- Principles

Precise specification

Design

Prototpe

- Dialog notations

Implement and deploy

Architectures
- Documentation
- Help

Evaluation
- Heuristics
The results:

(a) Control Group

(b) Experiment Group

Figure 5.2: Permission Statements Results: Correct, Incorrect and Neutral
27% of people think they know what this screen says and are wrong.

13% are uncertain what this screen really means.

(a) Control group screen
Case study from Nielsen Group
https://www.nngroup.com/articles/fancy-formatting-looks-like-an-ad/
Problem:

Why can’t people find the population of the United States on the Censes Bureau site?
Design process

What is wanted
- Interviews
- Ethnography

What is there vs. what is wanted
- Scenarios
  - Task analysis

Analysis
- Guidelines
  - Principles

Design
- Precise specification

Prototype
- Dialog notations

Implement and deploy
- Architectures
- Documentation
- Help
86% of users failed to find the population of the US on this page. Why?
The website does quite a few things correctly

- Most common task is large, obvious, and red
- Sections of the page are clearly labeled
- There is a search box
- Lots of navigation cues
- Sidebars clear
- Good use of grouping
Methodology options:

- Think aloud (best choice)
  - Good: lots of data articulated, people can tell you what they are looking for
  - Bad:

- Heuristic
  - Good: No need to find a participant
  - Bad: Looking at the site there are no obvious heuristics seriously broken, so any result would be an educated guess

- GOMS – Not really appropriate

- Contextual Inquiry – Unlikely to be a contextual issue
These researchers decided to use an eye tracker in addition to asking the participant to complete the task in a lab.
Users looked at the population box

Users also looked at the search box

They also looked at the sidebar

If you look closely you will see that users didn’t actually read the number. They only looked at the first three digits. They aren’t fixating, they are scanning and not finding what they want.
People didn’t use the feature

- Only 14% of participants used the Population Check feature

Why?
- It looks like an advertisement
- It uses terms like “Population Clocks” and “Data Finder” rather than “US Population”
CW2 Questions
Questions?